

## CLAIMS

What is claimed is:

1. A method for simultaneously conducting a plurality of micro-volume molecular haplotyping reactions, the method comprising:
  - (a) introducing a plurality of liquid samples into the sample chambers of a microhole apparatus, wherein the samples contain necessary molecular haplotyping reaction components; and
  - (b) placing the apparatus into an environment favorable to the molecular haplotyping reaction;  
wherein the microhole apparatus comprises a substrate, wherein the substrate defines a plurality of sample chambers, wherein each sample chamber:
    - (i) extends through the substrate;
    - (ii) comprises one or more walls and an opening at each end; and
    - (iii) holds a sample such that the sample is retained in the apparatus through surface tension and such that a liquid sample present in one sample chamber does not intermix with a liquid sample present in another sample chamber; and  
wherein the apparatus is substantially free of contaminating amplifiable polynucleotides.
2. The method according to claim 1 wherein the environment is selected from the group consisting of a hydrophobic medium and a humidified chamber.
3. The method according to claim 1, wherein results of the reactions are monitored.
4. The method according to claim 3 wherein the results are monitored by optical monitoring.

5. The method according to claim 1 wherein the results of the reactions are measured by mass spectrometry.
6. The method according to claim 1, wherein one or more of the reactions are supplemented with one or more reagents during the course of the reaction.
7. The method according to claim 1, wherein a reagent is affixed to the substrate.
8. The method according to claim 7 wherein the environment is selected from the group consisting of a hydrophobic medium and a humidified chamber.
9. The method according to claim 1, wherein the analysis is used to determine a haplotype.
10. An apparatus for containing multiple micro-volume liquid samples comprising a substrate, wherein the substrate defines a plurality of sample chambers, wherein each sample chamber:
  - (a) extends through the substrate,
  - (b) comprises one or more walls and an opening at each end, and
  - (c) holds a sample such that the sample is retained in the apparatus through surface tension and such that a liquid sample present in one sample chamber does not intermix with a liquid sample present in another sample chamber;wherein the apparatus is substantially free of contaminating amplifiable polynucleotides; and  
wherein the apparatus comprises at least one reagent used in a molecular haplotyping reaction to be carried out in the apparatus.

11. An apparatus according to claim 10 wherein the apparatus comprises at least two reagents used in a molecular haplotyping reaction to be carried out in the apparatus.

12. An apparatus according to claim 10 wherein the sample chamber has a height to width ratio of about 1:1, wherein the height of the sample chamber is measured from one face of the substrate to the other.

13. An apparatus according to claim 10 wherein the substrate comprises hydrophobic regions, wherein the hydrophobic regions are located on the substrate such that a liquid sample present in one sample chamber does not intermix with a liquid sample present in another sample chamber.

14. An apparatus according to claim 10, wherein the substrate comprises an upper face and a lower face.

15. An apparatus according to claim 14, wherein the through axes of the sample chambers are perpendicular to both faces of the substrate.

16. An apparatus according to claim 15, wherein the sample chamber has the shape of a right circular cylinder.

17. An apparatus according to claim 15, wherein the sample chamber has the shape of a right polygonal prism.

18. An apparatus according to claim 13, wherein the hydrophobic regions are located on the upper and lower faces of the substrate such that the openings of at least

one sample chamber from at least one adjacent sample chamber by a hydrophobic region.

19. An apparatus according to claim 18, wherein additional hydrophobic regions are located on the walls of the sample chambers.

20. An apparatus according to claim 13, wherein hydrophobic regions are located on the walls of the sample chambers.

21. An apparatus according to claim 20, wherein the hydrophobic region forms an annular ring along the wall of the sample chamber.

22. An apparatus according to claim 20, comprising two or more hydrophobic regions, each forming an annular ring along the wall of the sample chamber, wherein the hydrophobic regions define one or more annular non-hydrophobic rings therebetween.

23. An apparatus according to claim 10, wherein the at least one reagent is affixed to the substrate.

24. A kit comprising an apparatus for containing multiple micro-volume liquid samples for performing a molecular haplotyping reaction, comprising a substrate, wherein the substrate defines a plurality of sample chambers, wherein each sample chamber:

- (a) extends through the substrate,
- (b) comprises one or more walls and an opening at each end, and

(c) holds a sample such that the sample is retained in the apparatus through surface tension and such that a liquid sample present in one sample chamber does not intermix with a liquid sample present in another sample chamber;

wherein the apparatus is substantially free of contaminating amplifiable polynucleotides;

and further comprising a molecular haplotyping reaction component packaged in a suitable container.

25. A kit according to claim 24, wherein the molecular haplotyping reaction component is affixed to the substrate.

26. A kit according to claim 24, wherein the kit further comprises a hydrophobic substance to be used with the apparatus.

27. A kit according to claim 26, wherein the hydrophobic substance is a hydrophobic fluid packaged in a suitable container.

28. A kit according to claim 26, wherein the hydrophobic substance is a hydrophobic cover.

29. A kit according to claim 24, further comprising a chamber for maintaining the appropriate environmental conditions for a molecular haplotyping reaction to be carried out in the apparatus.

30. A kit according to claim 24, further comprising a device for loading samples into the sample chambers.

31. An apparatus for containing multiple micro-volume liquid samples comprising a substrate, wherein the substrate defines a plurality of sample chambers, wherein each sample chamber:

- (a) extends through the substrate,
  - (b) comprises one or more walls and an opening at each end, and
  - (c) holds a sample such that the sample is in the form of a thin film such that a liquid sample present in one sample chamber does not intermix with a liquid sample present in another sample chamber; and
- wherein the substrate comprises titanium.

32. An apparatus according to claim 31, wherein the sample chamber has a height to width ratio of less than 1:1, wherein the height of the sample chamber is measured from one face of the substrate to the other.

33. An apparatus according to claim 31 wherein the substrate comprises hydrophobic regions, wherein the hydrophobic regions are located on the substrate such that a liquid sample present in one sample chamber does not intermix with a liquid sample present in another sample chamber.

34. An apparatus according to claim 33, wherein the substrate comprises an upper face and a lower face.

35. An apparatus according to claim 34, wherein the through axes of the sample chambers are perpendicular to both faces of the substrate.

36. An apparatus according to claim 35, wherein the sample chamber has the shape of a right circular cylinder.

37. An apparatus according to claim 35, wherein the sample chamber has the shape of a right polygonal prism.

38. An apparatus according to claim 33, wherein the hydrophobic regions are located on the upper and lower faces of the substrate such that the openings of at least one sample chamber from at least one adjacent sample chamber by a hydrophobic region.

39. An apparatus according to claim 38, wherein additional hydrophobic regions are located on the walls of the sample chambers.

40. An apparatus according to claim 33, wherein hydrophobic regions are located on the walls of the sample chambers.

41. An apparatus according to claim 40, wherein the hydrophobic region forms an annular ring along the wall of the sample chamber.

42. An apparatus according to claim 40, comprising two or more hydrophobic regions, each forming an annular ring along the wall of the sample chamber, wherein the hydrophobic regions define one or more annular non-hydrophobic rings therebetween.

43. An apparatus according to claim 31 further comprising at least one component of a reaction to be carried out in the apparatus.

44. An apparatus according to claim 31 wherein a reaction component is affixed to the substrate.

45. An apparatus according to claim 31, wherein the component is a reagent used in a nucleotide sequencing reaction, a hybridization reaction, or a polynucleotide amplification reaction.

46. An apparatus according to claim 31, wherein the apparatus is substantially free from contaminating amplifiable polynucleotides.

47. A kit comprising an apparatus for containing multiple micro-volume liquid samples comprising a substrate, wherein the substrate defines a plurality of sample chambers, wherein each sample chamber:

- (a) extends through the substrate,
- (b) comprises one or more walls and an opening at each end, and
- (c) holds a sample such that the sample is in the form of a thin film such that a liquid sample present in one sample chamber does not intermix with a liquid sample present in another sample chamber; and

wherein the substrate comprises titanium.

48. The kit according to claim 47, wherein the sample chamber has a height to width ratio of less than 1:1, wherein the height of the sample chamber is measured from one face of the substrate to the other; and further comprising a reaction component packaged in a suitable container.

49. The kit according to claim 47, wherein the reaction component is a reagent for performing a reaction selected from the group consisting of ligation reactions, primer extension reactions, nucleotide sequencing reactions, restriction endonuclease digestions, oligonucleotide synthesis, hybridization reactions and biological interactions.



50. A kit according to claim 47, further comprising a hydrophobic substance to be used with the apparatus.

51. A kit according to claim 50, wherein the hydrophobic substance is a hydrophobic fluid packaged in a suitable container.

52. A kit according to claim 50, wherein the hydrophobic substance is a hydrophobic cover.

53. A kit according to claim 47, further comprising a chamber for maintaining the appropriate environmental conditions for a reaction to be carried out in the apparatus.

54. A kit according to claim 47, further comprising an apparatus for loading samples into the sample chambers.